Teacher Resource 2.1

Presentation Notes: Analog and Digital Signals

Before you show this presentation, use the text accompanying each slide to develop presentation notes. Writing the notes yourself enables you to approach the subject matter in a way that is comfortable to you and engaging for your students. Make this presentation as interactive as possible by stopping frequently to ask questions and encourage class discussion.

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| C:\Users\Mika\Documents\My Documents\Pearson\2013\June\23\Networking_Lesson2_Presentation_ROOT_062413\Slide1.JPG  This presentation describes the physical qualities of analog and digital signals and how those signals are used in communications networks. | Presentation notes |
| C:\Users\Mika\Documents\My Documents\Pearson\2013\June\23\Networking_Lesson2_Presentation_ROOT_062413\Slide2.JPG  Do you know which is the analog and which is the digital signal?  Here’s a clue to help you think about the differences between the two types of signals: an analog signal is continuous; a digital signal is either on or off. | Presentation notes |
| C:\Users\Mika\Documents\My Documents\Pearson\2013\June\23\Networking_Lesson2_Presentation_ROOT_062413\Slide3.JPG  This graph shows the square waveforms used by digital networks. The ups and downs in the waveform show changes in frequency. Can you see how the spacing between the high and low spots is different as the wave travels from left to right? This shows how the frequency changes over time and how this might be interpreted into binary: one or zero, on or off. Electronics detect a 0 if there is a down-going transition in the clock timing window and a 1 if there is an up-going transition in the clock timing window.  Computer systems use binary code to communicate. Ones and zeros are strung together to form instructions to the computer. Computer networks use electric pulses across wire to communicate. The pulses travel with less static and interference than analog signals, which tend to degrade more across longer distances.  In and of itself, a digital signal means nothing, but we can assign different meanings to it. We just need to make sure that the computers reading the signal know how to properly interpret it. | Presentation notes |
| C:\Users\Mika\Documents\My Documents\Pearson\2013\June\23\Networking_Lesson2_Presentation_ROOT_062413\Slide4.JPG  The sound of the human voice is an example of an analog signal. So, what makes it different from a digital signal?  An analog signal is a wave pattern that is continuously variable.  In the world around us, all sounds are actually analog sounds. Everything we perceive has a gradual change over time. Examples of analog signals include sound and light waves. Audio tape cassettes are analog; CDs and DVDs are digital.  Early cell phone systems used analog radio waves to transmit voice signals, so they were analog.  Second-generation (2G) and later cell phones are digital. They use the same radio technology as the early analog cell phones, but the digital signal is compressed in a way that analog signals cannot be. Digital cell phones compress your voice into binary information. Because they can be compressed, digital signals allow more channels to fit in a given bandwidth. | Presentation notes |
| C:\Users\Mika\Documents\My Documents\Pearson\2013\June\23\Networking_Lesson2_Presentation_ROOT_062413\Slide5.JPG  Modems are used to connect computers to the Internet via analog phone lines. The word *modem* is short for MOdulate and DEModulate, because this is what a modem must do in order to connect the digital to an analog signal.  When a user connects to the Internet on a telephone wire, the binary code is modulated and transformed to an analog one via a modem; it is then demodulated—or translated back to binary—at the other end.  ASCII is the system we use to translate the alphabets we type on a computer into the computer’s native binary language. Our full, rich alphabets of 26 letters, 10 numbers, and all the other symbols we use (such as punctuation) are too complicated for the computer, since the computer uses only electric pulses to communicate. So, ASCII translates the symbols into something the computer can understand within its binary structure. | Presentation notes |
| C:\Users\Mika\Documents\My Documents\Pearson\2013\June\23\Networking_Lesson2_Presentation_ROOT_062413\Slide6.JPG  The first computer networks relied on analog telephone lines to connect. Since the computer spoke in binary but the phone lines used only analog signals, the computer was connected to a modem, which translated the message into an analog signal. On the other end, the analog signal coming from the telephone line was converted back to a digital one so that the other computer could read it.  Today, most people use cable or DSL—digital lines—to connect to the Internet, which is a purely digital network.  DSL service uses a DSL modem to connect your computer to your public telephone service.  Cable service uses the cable TV infrastructure to bring an Internet connection to your home, school, or office. Cable companies that provide Internet service require you to use a cable modem to connect your computer to the Internet.  Some Internet service providers offer voice over Internet Protocol (VoIP) technology, which uses a modem that separates voice information from data. With VoIP, you don’t need a land line. Some telephone companies do not offer DSL service without telephone line service, although more companies are beginning to unbundle their DSL and phone services. Currently, VoIP is more popular with cable modem users. | Presentation notes |
| C:\Users\Mika\Documents\My Documents\Pearson\2013\July\4\Networking_Lesson2_Presentation_ROOT_062413\Slide7.JPG  As you learn more about computer networks, you will build on everything that you have learned about analog and digital signals. |  |